LIFE

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"TOOEY" SPAATZ
BOMBER OF JAPAN

AUGUST 20, 1945 10 CENTS
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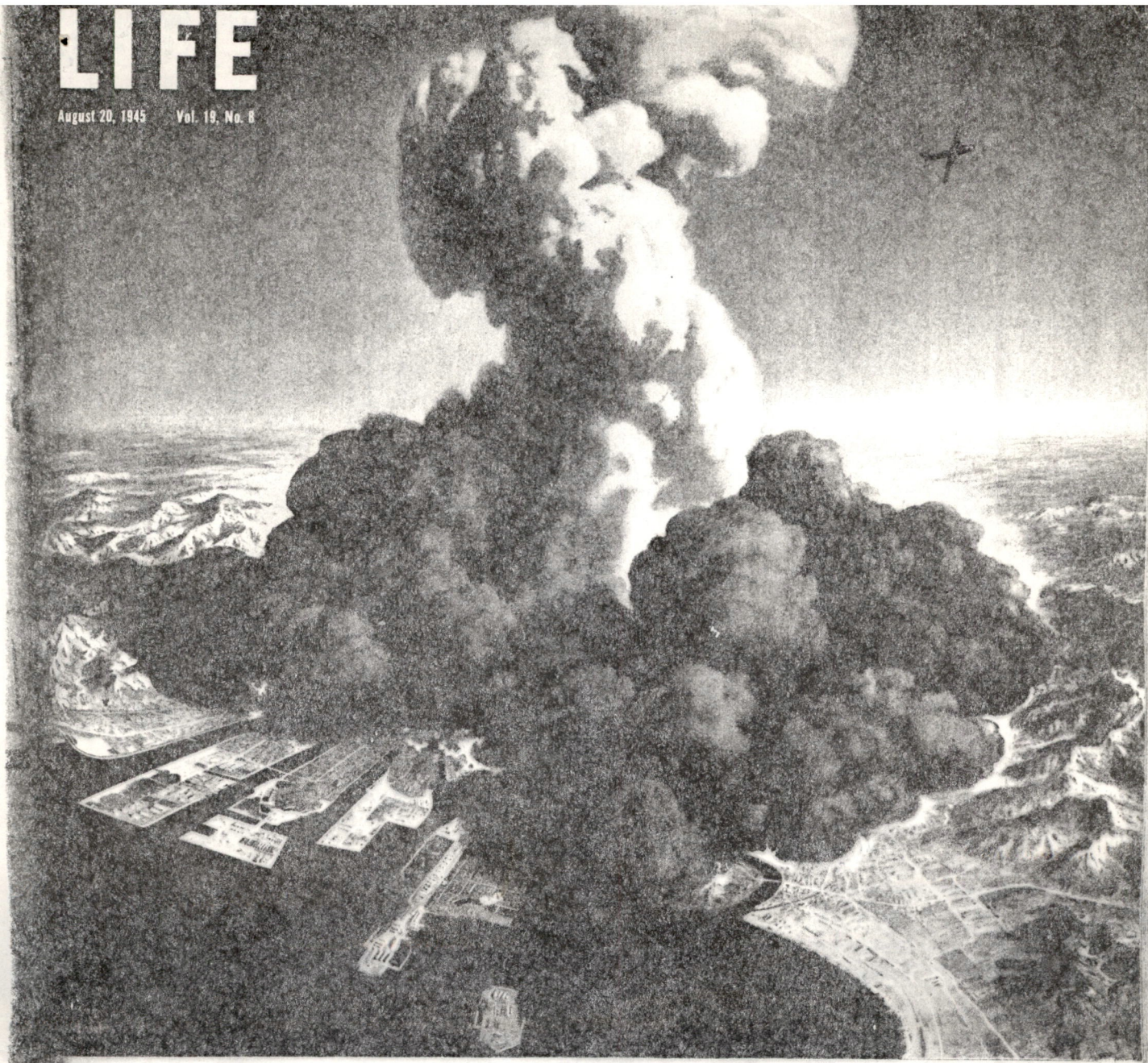
August 20, 1945 Vol. 19, No. 8



THIS DRAWING SHOWS MORE GRAPHICALLY THAN AERIAL PHOTOGRAPHS (PP. 26-27) EFFECT OF ATOMIC BOMB HIT ON HIROSHIMA. SMOKE BILLOWS 40,000 FEET

WAR'S ENDING

ATOMIC BOMB AND SOVIET ENTRY BRING JAP SURRENDER OFFER

The war against Japan was finally coming to an end last week. On Aug. 5 the first atomic bomb was let on Hiroshima (*see pp. 30–31*). On Aug. 8 Russia declared war on and attacked Japan. Same day, second atomic bomb fell, this one on Nagasaki. On Friday, Aug. 10, the Tokyo radio broadcast an bid for peace. Even before the official note had reached Washington through neutral channels, President Truman summoned his top military advisers to discuss the offer. The Japs, who in mid-July had vainly asked the Russians to mediate the Pacific war, now agreed to the Potsdam ultimatum, with one condition. They wanted Emperor Hirohito (*see p. 38D*) to retain his sovereignty and "prerogatives." A day of wild speculation and mild celebration followed while the President communicated by phone with Chungking, Moscow and London. The U. S., which had taken the lead in the negotiations, answered for all the Big Four. On Saturday morning Aug. 11 Secretary of State Byrnes sent a note to Tokyo accepting the Jap offer with the stipulation that the Supreme Allied Military Commander, presumably General of the Army Douglas MacArthur, rule Japan through the authority of the Emperor.

The people of the world, although thrilled by the prospect of peace, were shaken by the new weapon (*see p. 87B*), which had brought it about. Even General Carl Spaatz, whose airmen dropped the bombs, said hopefully, "Wouldn't it be an odd thing if these were the only two atomic bombs ever dropped?"

AGASAKI
M BOMB NO. 2
EMBOWELED IT

Seventy-five hours after the world's first atomic bombing, an interval marked by President Truman's demand for unconditional surrender, the second bomb was dropped on Nagasaki, shipbuilding port and industrial center. This bomb was described as an "improved type," easier to construct and productive of a greater blast. It landed in the middle of Nagasaki's industries and disemboweled the crowded city. Unlike the Hiroshima bomb, it dug a huge crater, destroying a square mile—30% of the city.

When the bomb went off, a flier on another mission 250 miles away saw a huge ball of fiery yellow erupt. Others, nearer at hand, saw a big mushroom of smoke and dust billow darkly up to 20,000 feet (*above*) and then the same detached floating head observed at Hiroshima. Twelve hours later Nagasaki was a mass of flame, palled by acrid smoke, its pyre still visible to pilots 200 miles away.

The bombers reported that black smoke had shot up like a tremendous, ugly waterspout. Physicists at the bomber base theorized that this smoke was the pulverized fragments of the Mitsubishi Steel and Arms Works. With grim satisfaction they declared that the "improved" second atomic bomb had already made the first one obsolete.

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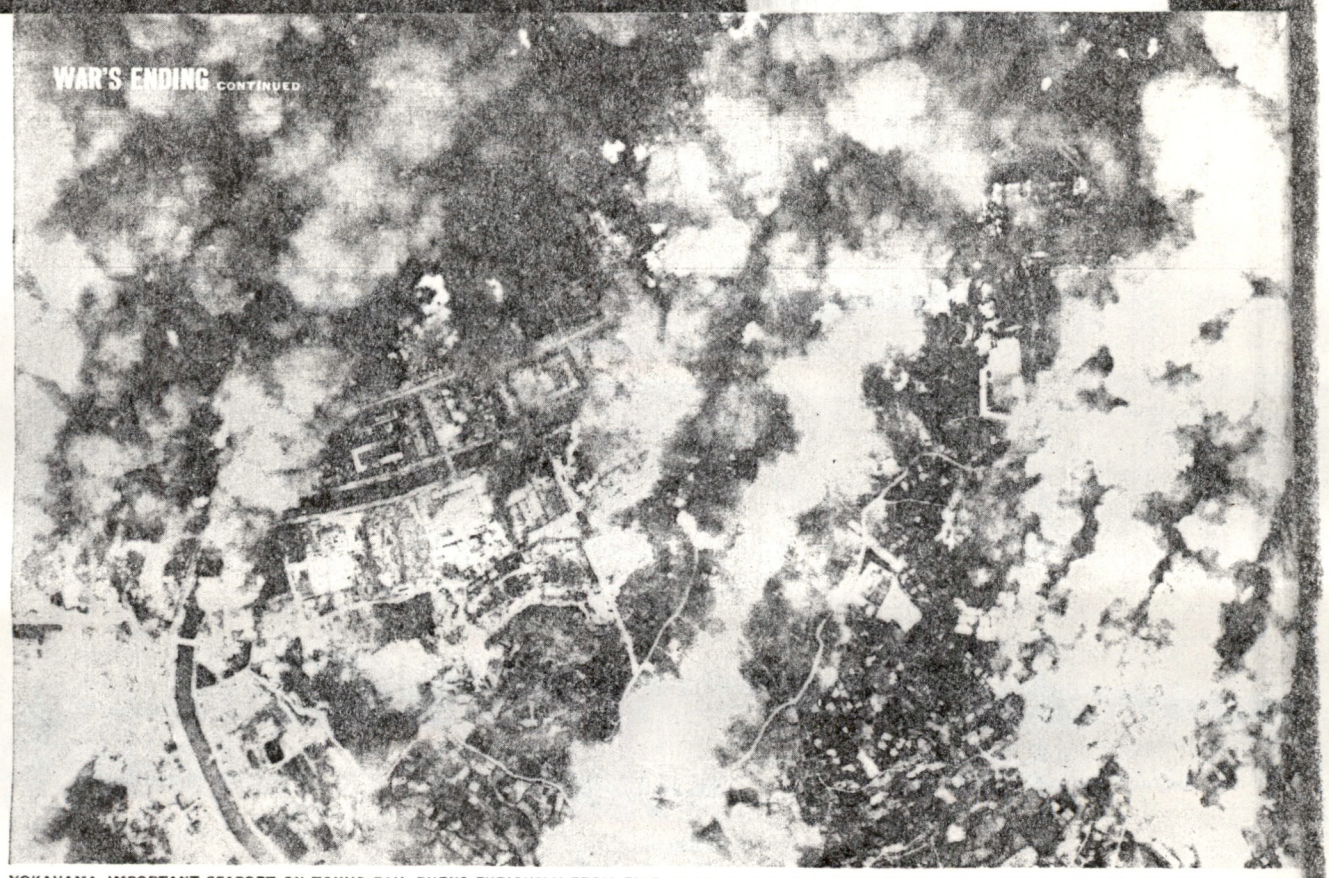


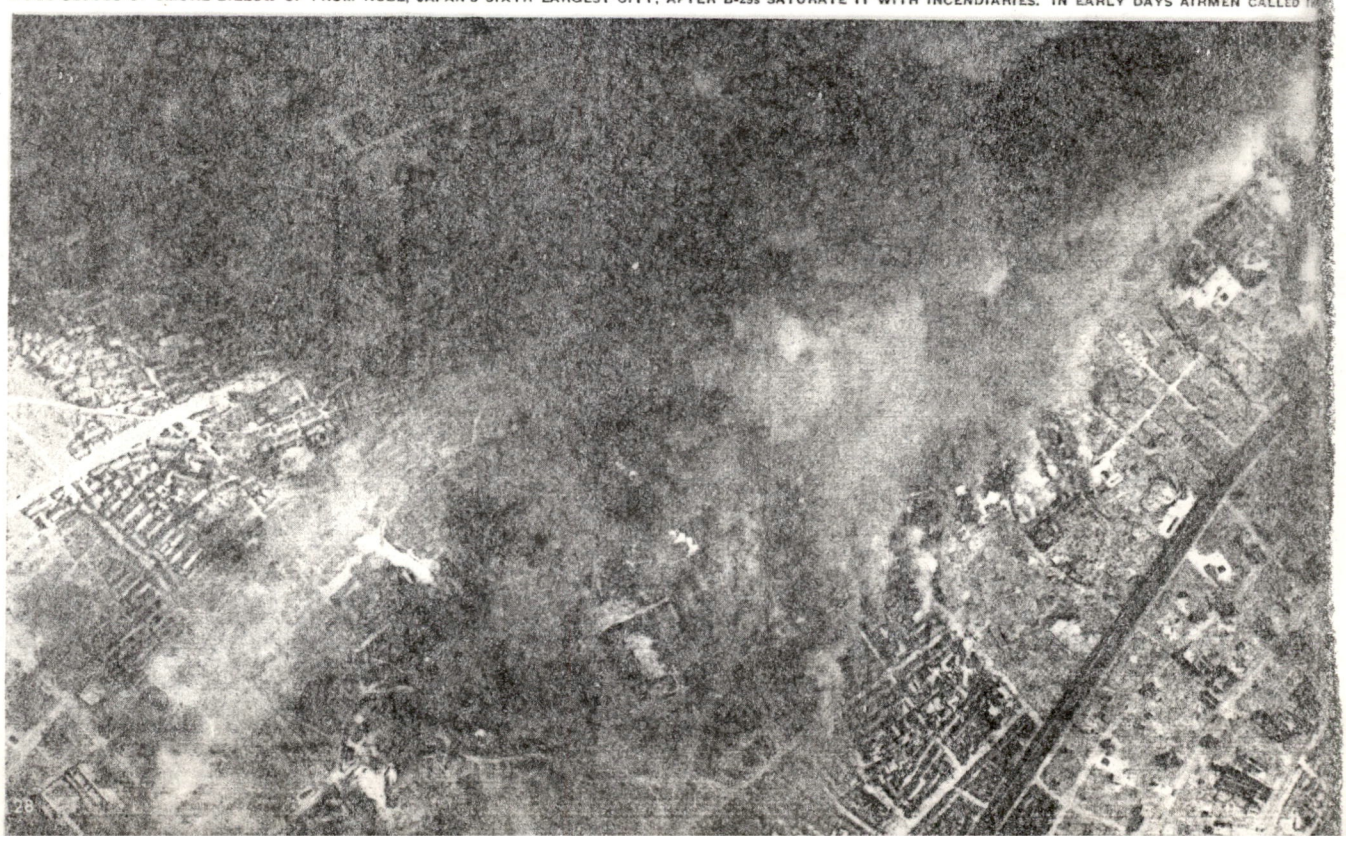
YOKAHAMA, IMPORTANT SEAPORT ON TOKYO BAY, BURNS FURIOUSLY FROM FIRE BOMBS WHICH B-29s DROPPED IN CALCULATED PATTERNS OVER CITY. FIRES SENT

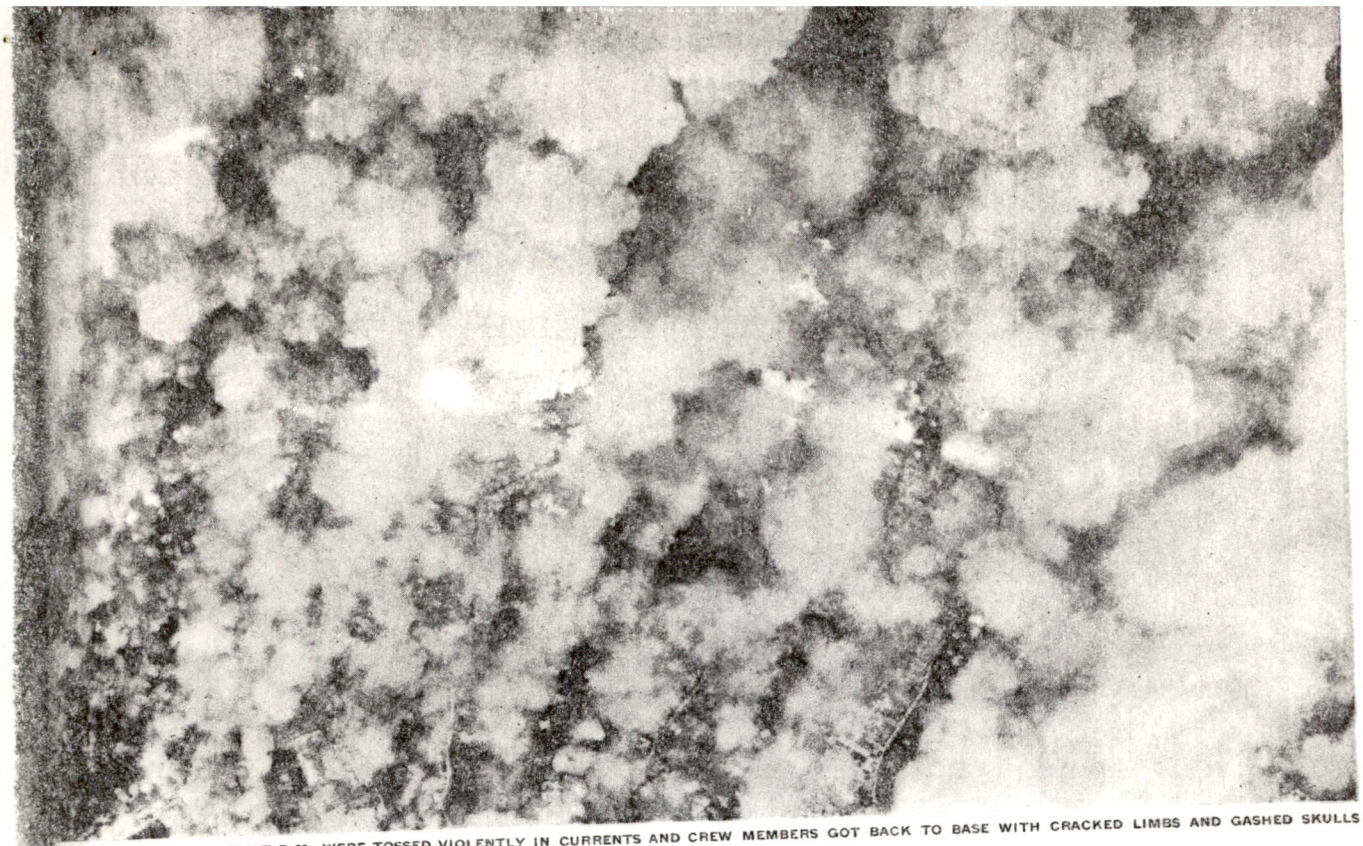
B-29s ALMOST FINISHED JOB

When the atomic bomb came, the strategic bombing of the enemy by the B-29s of the U.S. had already ripped the guts out of Japan's great cities. The five biggest industrial centers, Tokyo, Nagoya, Osaka, Kobe and Yokahama, were all crossed off the airmen's list of bombing objectives several months ago. Most of this pre-atomic destruction of Japan was done by a hard-bitten, taciturn major general named Curtis E. May, whose XXI Bomber Command and 20th Air Force, operating out of the Marianas, had isolated Japan with ingeniously planted mines, saturated her war plants with hundreds of tons of high explosives and, most efficient of all, burned out her cities.

Most of the B-29s on the fire-bomb missions c

HUGE CLOUDS OF SMOKE BILLOW UP FROM KOBE, JAPAN'S SIXTH LARGEST CITY, AFTER B-29s SATURATE IT WITH INCENDIARIES. IN EARLY DAYS AIRMEN CALLED TH





CH HUGE HEAT WAVES THAT B-29s WERE TOSSED VIOLENTLY IN CURRENTS AND CREW MEMBERS GOT BACK TO BASE WITH CRACKED LIMBS AND GASHED SKULLS

d the newly developed "jelly" bombs, which were ed at different spots in a city and calculated to rge into one huge conflagration. Airmen called them burn jobs" and a good-sized "burn job" did almost s much damage to property as the atomic bomb did d it also killed almost as many people. Japan's ming cities were unluckily spread along the Japanese coast where they could be easily spotted by the B-29s' radar (*see pp. 96 to 99*). Japanese defense against bombers weakened and then practically disappeared. In July, when 5,600 sorties were flown, only 17 were lost. When Carl A. ("Tooey") Spaatz (*see cover*) moved in as boss of the U. S. Strategic Air Force in the Pacific, fresh from the same job in Europe, he described the B-29 setup as the best-organized air operation he had ever seen. Then, with LeMay as chief of staff and seasoned veterans coming in from the European air war, Spaatz gave the air attack on Japan full throttle. Weeks ago, before they knew about the atomic bomb, airmen in the Pacific were talking about finishing off Japan without having to land troops on her shores.

PPROACH TO KOBE "FLAK ALLEY" BECAUSE JAPS, WHO HAD MOVED SHIPPING TO SHELTERED PORTS LIKE THIS, DEFENDED THEM WITH HEAVY ANTIAIRCRAFT FIRE

CONTINUED ON NEXT PAGE

HIROSHIMA
BEFORE

To the atomic-bomb-laden B-29 "Enola Gay" droning overhead, Hiroshima looked like this—a typically Oriental congestion of modern industry, rickety dwellings, shrines and quaint teahouses. It had a population of 344,000, which made it Japan's seventh city. It was a military center, dating from the days of the Russo-Japanese War when the mikado made its historic castle his wartime headquarters. In World War II its army transport base, ordnance depot and food depot (*lower right*) made it a military target, as did the nearby docks and textile mills.

In the heart of the city were oil stores, electrical works and many bridges spanning the arms of the Ota River on whose delta it stood. There were centuries-old temples and a public garden which was famous for its flowering trees.

HIROSHIMA AFTER

The mosaic of reconnaissance photos (*above*) made the day after Hiroshima was bombed shows circle of flattened ash, stretching almost four miles from foothills (*upper left*) well into the outlying eastern area (*right*). A few buildings still stood, spared by the freakish dynamics of explosion. Smoke drifted up.

Within the grim circle, in which 100,000 reportedly died, a rail station, generator station, Hiroshima's telephone company, scores of big buildings, hundreds of small ones were rubble. Eleven bridges were destroyed or damaged. Textile mills and rail centers nearer the circle's edge were damaged or 100% destroyed. Seriously damaged, too, were the relatively distant army bases. The atomic bomb had blown three fifths of Hiroshima off the face of the earth.

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EDITORIAL

THE ATOMIC AGE

THAT FLASH SHOWED WHERE MAN'S REAL PROBLEMS ARE: NOT UNDER THE BED BUT IN THE CELLAR

The Second World War, which had been tapering off to a whimper, is ending instead with a bang. That bang—the atomic bomb—caught the Allied world at the edge of a haunted doze. Still fighting, we had paused to sniff a dream, a dream of the return to "normal" life.

Our Congress had gone home to take bows for San Francisco and Bretton Woods, to start worrying about Russia and reconversion. Columnists had begun echoing the arguments of the quarrelsome '30s, using the same old lingo, the same old frames of reference. Had the ghost or disguised person of Adolf Hitler passed by two weeks ago, he might have reflected, "This is—or soon will be—where I came in."

Then a single bomb fell from a single plane on the shore of the Inland Sea, killing between one and two hundred thousand people.

THE TUNNEL

When man enters a year like 1939, he cannot expect ever to find the entrance to that fateful tunnel again. He is lucky enough to find the exit, which sends him out into an entirely different country. But how long it takes him to see the change! Even men who had most eagerly called this war a revolution did not recognize their own vindication.

Responses learned long ago dug their same old course through the individual nervous system. Cartoonists, still flexing democracy's muscles, went BAM! POW! and SO SORRY! at Jap expense. Left-wing editorialists at once voiced alarm lest "the cartels" come to control this uncontrollable new secret. Even President Truman, in his cool announcement of the miracle, struck no newer or grander note than national self-congratulation.

Not that there was no hysteria. In the French foreign office, technicians were busy annexing Saar and Ruhr coal; when they heard the news they felt foolish, wondered whether coal was obsolete, went fishing. Military scientists speculated wildly about what the new weapon does to armies, navies, the art of defense. For if there is no defense, then perhaps man must either abolish international warfare or move his whole urban civilization underground.

To such speculations Truman's cool and unimaginative tone was a salutary antidote. So, too, was the almost negligent manner in which he used—or rather failed to use—the atomic bomb as a diplomatic weapon against Russia. America, he said, is now "the most powerful nation in the world—the most powerful nation perhaps in all history." All the more reason, therefore, to stick to the Russian policy we had made before: to welcome Russia's entrance into the Japanese war and confirm our intention to keep world peace on a genuinely Allied basis. There were Americans who felt a Jovian impulse to redress the wrongs of Eastern Europe by threatening to hurl atomic thunderbolts from British bases. Instead we stood by Potsdam and our word.

Ay, do thy worst. Thou art omnipotent.
O'er all things but thyself I gave thee power...

Thus, in Shelley's version, did Prometheus defy his enemy Jove. But when America's omnipotence passes like Jove's it will not go down with a Promethean curse. So far, at least, we have shown some power over ourselves; Prometheus, the subtle artificer and friend of man, is still an American citizen. Not naked force, but "the basic proposition of the worth and dignity of man . . ." as Truman put it, "is the strongest, most creative force now present in the world."

ANTS AND MEN

After all, this bomb has been inevitable for a long time. American kids, fans of Flash Gordon, reacted to the news with peanut-butter stares which seemed to say, "What's all the excitement?" or, "*We've* had it for years." If you want to share the philosophic calm of childhood over this event, consider the ant, whose social problems much resemble man's. Ants have lived on this planet for 50 times as many million years as man. In all that time they have not committed race suicide and they have not abolished warfare either. Their nations rise and fall and never wholly merge. Constructing beautiful urban palaces and galleries, many ants have long lived underground in entire satisfaction.

ON THE TUNNEL WALLS

Thus ants and mythology both reassure us, in awe before the harnessed infinite. Yet our human position today needs measuring by more familiar standards. What was it we scratched on the tunnel walls?

The Japanese Christian, old Kagawa, made a broadcast after the Hiroshima holocaust. He said that American cruelty, expressed in this horrible weapon, exceeded that of Genghis Khan and contrasted especially with the "careful and thoughtful" Japanese air raids on Shanghai and Nanking against which we protested so piously in 1937. Strange as this sounds, it is not untrue. Every step in bomber's progress since 1937 has been more cruel than the last. From the very concept of strategic bombing, all the developments—night, pattern, saturation, area, indiscriminate—have led straight to Hiroshima, and Hiroshima was and was intended to be almost pure *Schrecklichkeit*.

It is bootless to argue at what stage of modern warfare, or by whom, the old Hague rules of war were violated. The point is that Americans, no less than Germans, have emerged from the tunnel with radically different practices and standards of permissible behavior toward others. A portent: When this bomb came into the world, human slavery was just being reintroduced into Europe, with specific American consent. You may not wish to call it "slavery," but Germans are doing forced labor for Russians without pay.

Sure, slavery is a matter of definition, a difference not of kind but of degree. So is "terror" bombing; so are all forms of cruelty; so is everything under the sun. Since Rutherford explored the atom's void there has been no excuse for not knowing that all differences are of degree. Atoms like those we split at Hiroshima make up all matter, all energy, all flesh; whether that flesh be "Greek or barbarian, Christian or Jew, bond or free."

IN THE CELLAR

Except for the hastened defeat of Japan, the atomic bomb answers no questions. But it rearranges the questions, old and new, large and small, already in men's minds and throws on all of them a blinding new perspective.

Two weeks ago such problems as Russia and reconversion were growing to be huge nameless shapes under the bed. Now they are just mundane, tangled, daylight questions. The really terrifying questions are not under the bed but in the cellar, where in fact they have been since man first built his house in this world. The most obvious of these questions is the question of power. The atomic scientists had to learn new ways to control it; so now does political man.

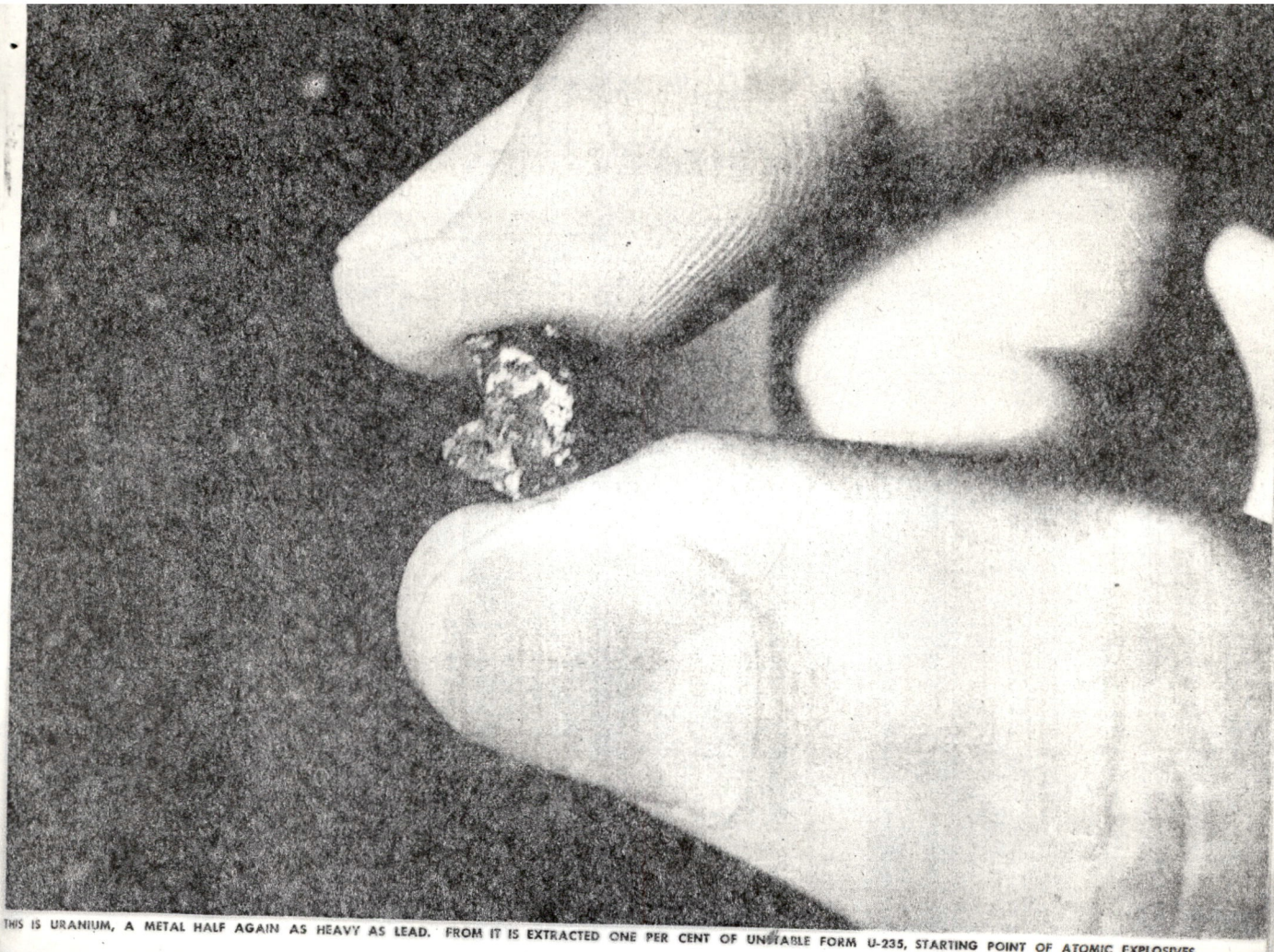
Power in society has never been controlled by anything but morality; and morality (in Bertrand Russell's formulation) is of two kinds: the social pressure of the dominant group ("positive" morality) and individual morality. Nowadays, says Russell, "positive morality [is] in effect a department of government." The example of Germany shows us how unsafe a guide that is.

Our sole safeguard against the very real danger of a reversion to barbarism is the kind of morality which compels the individual conscience, be the group right or wrong. The individual conscience against the atomic bomb? Yes. There is no other way.

The thing for us to fear today is not the atom but the nature of man, lest he lose either his conscience or his humility before the inherent mystery of things. Atomic science certifies this mystery. Its own laws condemn us to ultimate ignorance; but also to the eternal freedom of choice inherent in an indeterminate universe. No limits are set to our Promethean ingenuity, provided we remember that we are not Jove. We are not ants either; we can abolish warfare, and mitigate man's inhumanity to man. But all this will take some doing. And we are in a strange new land.

PICTURE OF THE WEEK:

As the war was ending, the Navy let the country get its first look at one of its secret operations: refueling at sea. So important was this refueling operation that Admiral Nimitz called it his "secret weapon." Fleet oilers, going out into battle areas to rendezvous with warships within range of enemy planes and submarines, freed the fighting fleets from dependence on land bases, enabled them to stay at sea for months and strike at will anywhere in the big ocean. Bold methods of mid-ocean refueling while ships were on the move gave the fleet unheard-of freedom and endurance which, as much as its size and firepower, made the U. S. Navy a new kind of sea weapon.



THIS IS URANIUM, A METAL HALF AGAIN AS HEAVY AS LEAD. FROM IT IS EXTRACTED ONE PER CENT OF UNSTABLE FORM U-235, STARTING POINT OF ATOMIC EXPLOSIVES

THE ATOMIC BOMB

ITS FIRST EXPLOSION OPENS A NEW ERA

Aug. 5, 1945 is the day men formally began a new epoch in their history. This is when they first used the force which binds the nucleus of the atom to do their work. The job happened to be the ending of the war between the United States and Japan, but this was pure coincidence. Even the appalling fact that some 100,000 Japanese had died seemed incidental to the fact—which touched the destiny of everyone alive—that a way had been found to release the forces which killed these 100,000.

The area of ideas where scientists worked to liberate the energy of the atomic nucleus was explored by the most powerful train of sheer intellect in the history of science (*see pp. 92–93*). Nobody has ever seen an atom. Yet scientists have defined it, predicted its behavior and even taken it apart using only fragmentary evidence.

The atom is a finite, measurable thing. It is composed of a heavy, dense nucleus surrounded by a vaporous cloud of electrons. The nucleus is one 2,500,000,000,000th of an inch in diameter. The diameter of the electron cloud is one 250,000,000th of an inch. Between the nucleus and its outermost electrons there is a yawning distance 5,000 times the diameter of the nucleus. If the nucleus were as big as the earth, the distance to its farthest electron would be 150 times the difference between the earth and the moon.

In nature there are 92 different kinds of atoms. The lightest, hydrogen, has only one electron circulating around its nucleus. The heaviest, uranium, has 92. Between hydrogen and uranium are the 90 other elements. The number of their electrons determines their physical characteristics.

Electrons, however, are not the dominating force of the atom. Electrons may be stripped from their atoms—by heat, for instance. It is electrical charges in the nucleus which determine the number of electrons. It is in the nucleus that science has found the apocalyptic forces released over Hiroshima.

The nucleus of the atom is made up of particles called protons and neutrons. It has an essential stability. Its particles are far more difficult to tear loose than electrons. In fact, up to 1939 the most powerful atom-smashing machines could knock only a few particles out of a nucleus which might contain 200 of them. After a revolutionary new discovery, however (*see pp. 88–89*), scientists were able to split certain nuclei almost in two, turning a fraction of their matter into pure energy. In addition to releasing new forces, this provided another proof of the Einstein theory that matter is simply energy in another form.

Present process for releasing the power of the nucleus is still imperfect. It requires quantities of uranium, which is too costly to be practical for anything but wholesale destruction. But science has made the first step. Its history promises that in time the others will follow, releasing the energy of the atom's nucleus for driving automobiles and airplanes, doing useful things practical men still don't dare to dream about.

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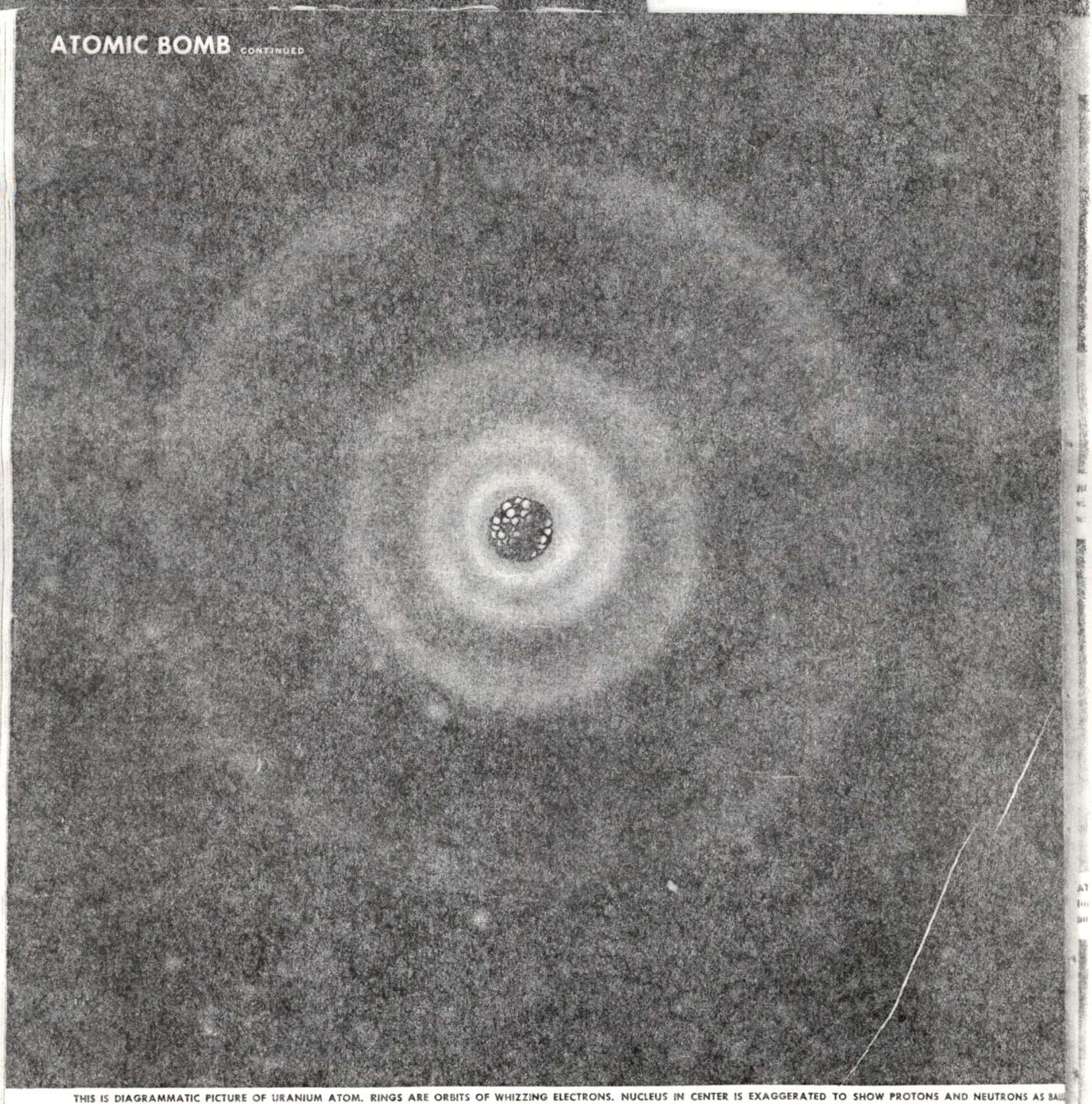


THIS IS DIAGRAMMATIC PICTURE OF URANIUM ATOM. RINGS ARE ORBITS OF WHIZZING ELECTRONS. NUCLEUS IN CENTER IS EXAGGERATED TO SHOW PROTONS AND NEUTRONS AS BALL

NUCLEAR FISSION

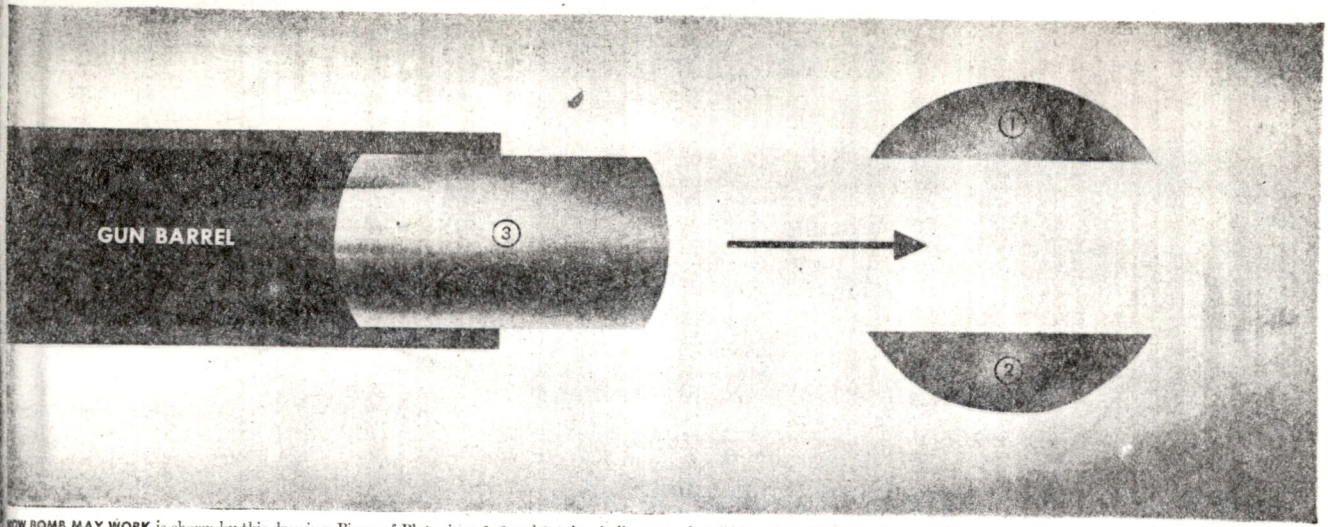
SPLITTING NUCLEUS RELEASES ENORMOUS AMOUNT OF ENERGY

The uranium atom is the most complex of all atoms. It consists of 92 electrons, each with a charge of negative electricity, spinning in orbits around its tiny but heavy nucleus. The nucleus is made up of 92 positively charged protons plus 146 neutrons, which are electrically neutral. The forces holding these particles together in the nucleus are tremendously powerful. If the cohesive forces are overcome and the nucleus disrupted, part of the atom's mass is converted to energy and atomic explosion results.

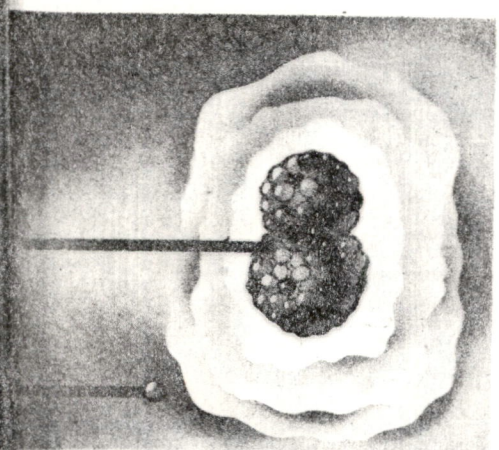
If a uranium atom has 146 neutrons in its nucleus it is called U-238 (92 protons + 146 neutrons = 238). If it has 143 neutrons it is called U-235 (92 protons + 143 neutrons = 235). These slightly different forms of uranium are called isotopes. Just before the war it was discovered that U-235 could be split by adding to its nucleus a slow-moving neutron produced with the aid of radium or a cyclotron. An enormous release of energy resulted from the fission, or splitting—but only on a small laboratory scale. The problem of ob taining practical atomic power at that time seemed to be a matter of accumulating sufficient quantities of pure U-235—an almost impossible task in the light of then-known techniques.

Last week the War Department announced that physicists of the atomic bomb project had produced an artificial element, plutonium, the end product of a reac tion begun by bombarding U-238 with neutrons derived from the fission of U-235. This new element, easier to set off than U-235 and now made in quantity, is presum ably a prime factor in the power of the atomic bomb. Plutonium, like U-235, is split by adding a neutron to its nucleus.

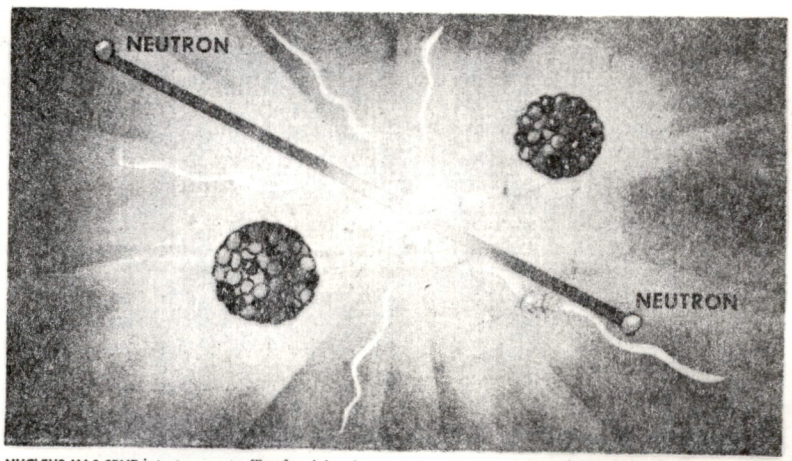
Mechanism of the bomb probably consists of bring ing several pieces of plutonium or uranium isotope together instantaneously by mechanical means (*see op posite page*). Once enough pieces have been accumu lated in a single "critical" mass, the bomb explodes



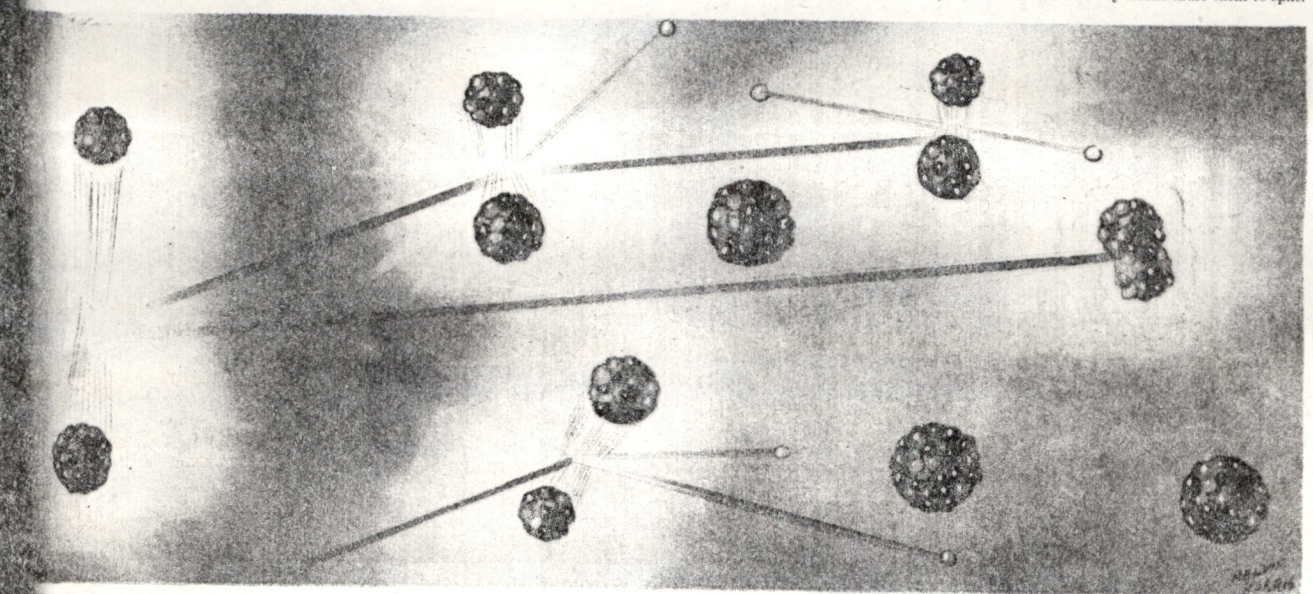
HOW BOMB MAY WORK is shown by this drawing. Pieces of Plutonium, 1, 2 and 3, taken individually are too small to detonate by themselves. Therefore bomb may be safely transported with charge divided into three parts. Bomb explodes when piece No. 3 is fired between pieces 1 and 2. This unites all three pieces into a sphere of "critical mass" and the bomb detonates. Biggest problems in bomb research solved at New Mexico laboratory was to unite all three pieces quickly, and completely. Partial or slow union will produce weak explosion or a dud.



ATOMIC FISSION BEGINS when stray neutron enters the nucleus of a Plutonium atom. In this picture neutron has just entered nucleus. Forces inside nucleus are already seriously unbalanced and it is beginning to split in two.



NUCLEUS HAS SPLIT into two parts. Total weight of parts is less than that of original nucleus. Difference in mass has been converted into millions of electron volts of energy. Fission also produces gamma radiation (wavy lines) and about two new neutrons which rush outward. Any which enter other nearby nuclei cause them to split.



CHAIN REACTION starts when neutrons from original fission (*left*) create fission in other nuclei which in turn produce more neutrons and more fissions until many nuclei in mass of Plutonium are split and enormous atomic explosion has occurred. When piece of Plutonium is small (piece No. 1, *top picture*) so many neutrons escape into surrounding air chain reaction cannot take place. Such a chain reaction is necessary to the production of any appreciable amount of atomic power. Uranium and Plutonium are only elements likely to produce chain reaction.

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